The Examiner is referred to page 13 of the Specification, beginning on line 14, for a description of the alignment assembly 27, and to page 24, beginning on line 7, for a description of the patient head rest 57 with alignment means 58, 59.

The alignment assembly 27 is provided as a portion of the apparatus and includes the near field and far field fixation targets 7 and 8, which are viewed by the patient in order to determine the patient's line of sight with respect to the apparatus. In order to more clearly define this feature, applicants propose that the language "as an alignment determining assembly" be added to the specification on page 13 line 14 after "alignment assembly 27".

The alignment means 58, 59 is provided as a part of the patient head rest 57 and operates to enable the patient to adjust the position of his or her head relative to the apparatus. In this manner, the alignment means 58, 59 allows the patient to align themselves relative to the alignment assembly 27.

Accordingly, the patient head rest 57 with alignment means 58, 59 is an element of the invention which is separate from the alignment assembly 27. In order to more clearly define the patient head rest 57 with alignment mens 58, 59, applicants propose that the specification be amended to indicate that the patient head rest 57 includes means for aligning the patient's eye with respect to the apparatus. This amendment is proposed to

be made on page 24, line 7 of the specification with the addition of the language "includes means for aligning the patient's eye with respect to the apparatus".

The Examiner has also indicated that the specification fails to disclose why the convex generally rectangular slit will provide a convex generally rectangular slit image.

The Examiner is referred to page 20, line 18 which describes the reason why the convex generally rectangular slit will provide a convex generally rectangular slit image. Generally, a slit that is planar in the focal plane of the lens used to project it will, for a well designed projection lens, be planar to the image plane. The image plane is defined as that plane perpendicular to the axis of projection which lies at a distance from the lens that provides the best focus. The image of the slit will be in focus over its entire length (and width) only in the image plane, and will out of focus (indistinct edges) for all positions lying outside of the image plane. Accordingly, this type of situation is adequate in instances where the projection of the image of the planar slit is on to a planar surface, such as a film plane.

However, in the case of projection of the image of the planar slit onto a cylindrical or spherical surface which is convex toward the projection lens, such as the eye, the image of the slit will not be in focus except at the points where the

curved surface of the eye intersects the image plane. Accordingly, the projection of the planar slit falling upon the portion of the eye which does not intersect the image plane will be out of focus. For instance, if the radius of the eye is of the same order as the long direction of the slit, the light falling upon the eye will appear to be substantially broader and less defined the further the distance from the intersection of the eye and the image plane of the planar slit. This lack of a well defined slit of illumination causes a major problem when viewing transparent or translucent surfaces, such as the cornea of the eye, in that the viewed crossed-section of the cornea appears fuzzy except immediately adjacent (such as within 3mm of diameter) of the intersection of the planar slit and the cornea.

The same condition noted above exists for an image captured upon a recording medium, such as a CCD camera and recording device. For instance, in the case where one wishes to perform edge detection of the front and rear corneal surfaces and the lens by computer automated methods, the lack of a well defined (focused) slit will lead to erroneous results. These particular problems, while always there, only become limiting as the measurement of the cornea is extended beyond about the central 6mm. For example, with refractive surgery, it is necessary to measure the entire cornea, which may have an apparent diameter of 13mm.

As described in the present application, the manner to obtain the best focused (narrowest and best defined) illumination of an approximately regular curved surface, such as the eye, is to have a real slit image formed convex toward the projection lens, and whose best focus lies on a cylinder whose radius approximates that of the regular curved surface. This can be accomplished by fabricating a slit on the surface of a cylinder whose axis lies perpendicular to the projection axis. This slit may be fabricated by etching a slit through a thin piece of metal and then bending the metal onto a cylindrical retaining form. If the slit is to be adjustable, such as in convential devices employing a planar slit, then it is fabricated from two cylindrical rods that are constrained to move uniformity apart from the central line of the projection axis, each of the rods having been machined with proper defining knife edges.

The Examiner has also raised certain specific questions in relation to the rejection that the specification fails to disclose why the convex generally rectangular slit will provide a convex generally rectangular image. The Examiner is correct in his first question that the time that the light travels each point from the convex generally rectangular slit to the corresponding point on the surface of the cornea is the same. The next question raised by the Examiner is whether the convex generally rectangular slit should have substantially the same shape as the cornea. Applicants submit that the only requirement

is that the shape of the convex generally rectangular slit have substantially the same shape with the cornea in one direction, which is along the length of the slit, and the width of the slit can be as great as desired as long as it still approximates the spherical surface upon which it falls.

The Examiner has also indicated that it appears to the Examiner that the projected image of a rectangular slit or of a convex generally rectangular slit on the cornea is a convex generally rectangular slit image because of the curved surface of the cornea. As noted above, the distinction is that a rectangular slit will provide a convex illumination pattern on the curved surface of the cornea rather than a convex generally rectangular slit image which is provided by the present In particular, since a projected image of a invention. rectangular slit will not be in focus over the entire cornea, the projection of a rectangular slit on the cornea defines merely an illumination pattern rather than an image. Specifically, the term "image" is defined as the optical counter-part of an object produced by an optical device. SEE Webster's New Collegiate Dictionary, (G. & C. Merriam Company, Springfield, MA, 1981), Page 566 (a copy of which is enclosed as Exhibit A). present invention, the convex generally rectangular slit provides a convex generally rectangular slit image since the projection is in focus over the entire cornea.

Further, the term "fixation" has been changed to "alignment" on pages 16 and 18 of the specification for consistency.

In view of that set forth above, applicants respectively solicit reconsideration and withdrawal of the objection to the specification under 35 USC § 112, first paragraph.

Claims 1-38 stand rejected under 35 USC § 112, first paragraph, for the reasons set forth in the objection to the specification. This rejection is respectfully traversed.

For the same reasons recited above with respect to the objection to the specification, applicants respectively solicit reconsideration of claims 1-38 and withdrawal of the rejection under 35 USC § 112, first paragraph. In addition, it is noted that the limitation "alignment assembly" has been amended in order to more clearly recite this feature as "alignment determining assembly".

Claims 1-38 stand rejected under 35 USC § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. This rejection is respectfully traversed.

The claims have been amended in view of the Examiners comments in an ernest attempt to satisfy the rejection under 35 USC § 112, second paragraph.

Specifically, in claims 1 and 2 the limitation relating to "aligning means" was deleted and replaced with "alignment determining assembly" in claim 2.

Furthermore, in claim 1 the feature of the capturing means has been more clearly defined.

In claims 12, 13 and 14 the phase "said apparatus" has been changed to said capturing means for clarity.

Claim 16 was amended to recite a second capturing means in order to relate to the capturing means in claim 1, and claim 17 has been cancelled.

Claims 22 and 27 have been revised in order to more clearly present the subject matter of those claims in view of the Examiners comments. In particular, in claim 27, the phase "imaging axis" has been amended to "imaging detection axis" and the phase "read" has been amended to "record". In addition, the term "alignment assembly" was amended to "alignment determining assembly". Further, in claim 27, line 16 the phase "perpendicular to a surface of the eye" has been revised to read

"perpendicular to the image of the slit upon the eye" in order to more clearly define that set forth in the specification, for instance, on page 9, lines 1-3.

In claims 35, 36 and 38, the term "said device" has been changed to said first and second cameras for clarity.

The claims as amended and now presented are believed to satisfy the rejections under 35 USC § 112, second paragraph, and applicants respectfully solicit reconsideration of claims 1-38 and withdrawal of the rejection under 35 USC § 112, second paragraph, for this reason.

Claims 39 and 40 are newly added dependent from claim 1 and set forth the feature that the apparatus further comprises a head rest and the head rest includes means for aligning the eye of the patient with respect to the apparatus. In claim 40 it is set forth that the aligning means comprises adjustments means for varying a vertical or a horizontal position of the eye with respect to the apparatus.

The Examiner has indicated that it appears that means for rotating the projecting means and the captioning means about the optical axis of the eye could be allowable over the prior art record.

The Examiner has also indicated that the title of invention is not descriptive, and requires that a new title be presented which is clearly indicative of the invention to which the claims are directed. In order to satisfy the Examiner's requirement, applicants have revised the title to read "Apparatus and Method for Imaging Anterior Structures of the Eye".

The prior art made of record and not relied upon is not considered any more pertinent to applicants disclosure then that already cited.

In view of all of that set forth above, applicants respectfully solicit reconsideration and allowance of the present application. The Examiner is invited to contact the undersigned for any further clarification of this response.

Respectfully submitted,

Date: April 11, 1996

Order No.: 0335

Paul A. Taufer

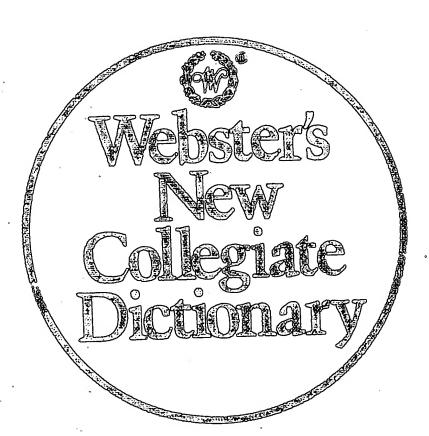
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a merriam-Welster

## Webster's New Collegiate Dictionary 150th Anniversary Edition



The G. & C. Merriam Company 1831-1981

Presented to

ill-ness \il-nes\ n 1 obs a: WICKEDNESS b: UNPLEASANTNESS 2: an unhealthy condition of body or mind: SICKNESS il-log-ic \(\(\frac{1}{2}\)il-\(\frac{1}{2}\)ij-ik\ n [back-formation fr. illogical]: the quality

or state of being illogical: ILLOGICALITY

il-log-i-cal \-i-k>l\-ai = 1: not observing the principles of logic 2: devoid of logic: SENSELESS — il-log-i-cal-i-ty \(\frac{1}{2}i-\frac{1}{2}

ors or with often elaborate designs or miniature pictures — il-lu-mi-nat-ing-ly \-,nāt-in-lē\ adv — il-lu-mi-na-tor \-,nāt-ər\ n
3||-||u-mi-nats \-nət\ n, archaic: one having or claiming unusual

nating or in decorative lighting

HKIT

illusion, illusio, fr. L, action of mocking, fr. illusus, pp. of illudere to mock at, fr. in-+ ludere to play, mock — more at LUDICROUS 1 a obs: the action of deceiving b (1): the state or fact of being intellectually deceived or misled: MISAPPREHENSION (2) an instance of such deception 2 a (1) : an instance of such deception 2 a (1): a misleading image presented to the vision (2): something that deceives or misleads intellectually b (1): perception of something objectively existing in such a way as to cause misinterpretation of its actual patterns. thing objectively existing in such a way as to cause misinterpretation of its actual nature

(2): HALLUCINATION I (3): a pattern capable of reversible perspective 3: a fine plain transparent bobbinet or tulle usumade of silk and used for veils, trimmings, and dresses syn see DELUSION — il-lu-sional \alpha-'iizh-nal, -an-'\alpha di

| il-lu-sion-ary \il-'ii-zh-\ner-\early adj: ILLU-optical illusions: A: a sory syn see APPARENT ant factual, materen-of-fact

| il-lu-sion-ism \il-'ii-zh-\niz-am\n: the use may appear nearer the of artistic techniques (as perspective or observer; C: o may be shading) to create the illusion of reality esp. regarded as either the in a work of art — | il-lu-sion-ist\-\ii-ii-nis-tik\ adj | il-lu-sion-is-tic\-\ii-ii-siv\. -'ii-ziv\ adj: ILLUSORY — | il-lu-sive-ly adv — | il-lu-sive-ness n

| Illusory \il-\iis-(=)r\vec{c}, -\iiz-\ adj: based on or producing illusion: DECEPTIVE (\simeq hopes) syn see APPARENT ant factual, matter-of-fact — illusori-ly \-(-)-)r\vec{c}, adv — illusori-ness \-(-)-)r\vec{c}-nos\

illust or illus abbr illustrated; illustration

illustror illusabbr illustrated; illustration illustratus, til-us-trate 'ill-us-trate', 'til-us-trate'; -trat-ing [L illustratus, pp. of illustrare, fr. in- + lustrare to purify, make bright — more at LUSTER] vr 1 obs a: ENLIGHTEN b: to light up 2 a archaic: to make illustrious b obs (1): to make bright (2): ADORN 3 a: to make clear: CLARIFY b: to make clear by giving or by serving as an example or instance c: to provide with visual features intended to explain or decorate (~ a book) 4: to show clearly: DEMONSTRATE ~ vi: to give an example or instance — illustration \\[ \frac{1}{1}\cdot -2s-\rangle \frac{1}{1}\cdot -2s-\rangle \rangle \frac{1}{1}\cdot -2s-\rangle \frac{1}{1}\cdot \frac{1}{1}\cdot -2s-\rangle \frac{1}{1}\cdot -2s-\r

something clear or attractive syn see INSTANCE — il-lus-tra-tional \-shnol. -shon-l\ adj

il-lus-tra-tive \il-'9s-trat-iv\ adj: serving, tending, or designed to illustrate (~ examples) — il-lus-tra-tive-ly adv il-lus-tri-ous \il-'9s-trē-9s\ adj [L illustris. prob. back-formation fr. illustrare] 1: notably or brilliantly outstanding because of dignity or achievements or actions: EMINENT 2 archaic a: shining brightly with light b: clearly evident syn see FAMOUS ant infamous — il-lus-tri-ous-ly adv — il-lus-tri-ous-ness n il-lus-tri-ous-ly adj: of, relating to, or marked by illuviation or illuviated materials or areas

tion or illuviated materials or areas

zon and deposited in another
ill will n: unfriendly feeling syn see MALICE ant goodwill, char-

ity ill-wish-or \il-wish-or, -\wish-\n: one that wishes ill to another il-ty \il-(i)\ill-\adv: not wisely or well: BADLY, ILL (his ~ concealed pride — Della Lutes)

pride — Della Lutes)

li-lyr-lan \(\frac{1}{1-\overline{

U.S.S.R.]: a usu. massive iron-black mineral relices composed of iron, titanium, and oxygen ILO abbr International Labor Organization Iloca-no or Iloca-no or Iloca-no or Ilokano or Ilokano 1 a: a major people of northem Luzon in the Philippines b: a member of this people 2: the Austronesian language of the Ilocano people ILS abbr instrument landing system

IM abbr intramural

IM abbr intramural

Im—see IN
Im\()jim\: I am

Image \im-ij\ n [ME, fr. OF, short for imagene, fr. L imagin, image \im-ij\ n [ME, fr. OF, short for imagene, fr. L imagin, image, kim to L imitari to imitate] 1: a reproduction or imitation of the form of a person or thing; esp: an imitation in solid form: STATUE 2 a: the optical counterpart of an object produced by an optical device (as a lens or mirror) or an electronic device b: a likeness of an object produced on a photographic material 3 a: exact likeness: SEMBLANCE (God created man in his own ~ —Gen 1:27 (RSV)) b: a person strikingly like another person (he is the ~ of his father) 4 a: a tangible or visible representation: INCARNATION (he is the ~ of filial devotion) b archaic: an illusory form: APPARITION 5 a (1): a mental picture of something not actually present: IMPRESSION (2): a mental conception held in common by members of a group and symbolic of a basic attitude and orientation (a disorderly courtroom can seriously tarnish a community's ~ of justice —Herbert Brownell) b: IDEA CONCEPT 6: a vivid or graphic representation or description 7: FIGURE OF SPEECH 8: a popular conception (as of a person striking the seriously tarnish as of the seri tion 7: FIGURE OF SPEECH 8: a popular conception (as of a person, institution, or nation) projected esp. through the mass media (promoting a corporate ~ of brotherly love and concern —R. C. 9: a set of values of a mathematical function (as a homo-Buck) 9: a set of values of a mathematical function (as a homomorphism) that corresponds to a particular subset of the domain 2 image vb imaged; imageling vt 1: to describe or portray in language esp. in a vivid manner 2: to call up a mental picture of: IMAGINE 3 a: REFLECT, MIRROR b: to make appear: PROJECT 4 a: to create a representation of; also: to form an image of b: to represent symbolically  $\sim vi$ : to form an image image orthicon n: a highly sensitive television image tube that uses secondary emission and electron multiplication to produce the output signal

output signal

output signa.

image-ry \im-ij-(2-)r\(\bar{c}\)\ n 1: the product of image makers: IM
AGES: also: the art of making images 2: figurative language 3: mental images; esp: the products of imagination

image tube n: an electron tube in which incident electromagnetic

radiation (as light or infrared) produces a visible image on its fluo
rescent screen duplicating the original pattern of radiation—

called also image convertes.

\*Imaginal (m-a-gan-1, -ag-an-) adj [NL imagin-, imago]: of or relating to the insect imago imagi-nary \im-'aj-a-,ner-\(\frac{1}{2}\) adj 1: existing only in imagination: lacking factual reality 2: containing or relating to the imaginary untr — imagi-nari-ly \im-aj-a-ner-a-l\(\frac{1}{2}\) adv — imagi-nari-ness \-'aj-a-,ner-\(\frac{1}{2}\) im-gaj-a-ner-a-l\(\frac{1}{2}\) adv — imagi-nari-ness \-'aj-a-,ner-\(\frac{1}{2}\) imaginary. IMAGINARY. FANCIFUL. VISIONARY. FANTASTIC. CHIMERICAL shared meaning element: unreal or unbelievable antreal, actual imaginary number n: a complex number (as 2 + 3i) whose imaginary part is not zero — called also imaginary unariary part n: the part of a complex number (as 3i in 2+3i)

inary part is not zero—called also imaginary imaginary part n: the part of a complex number (as 3i in 2+3i) that has the imaginary unit as a factor imaginary unit n: the positive square root of minus 1: + imagi-na-tion \im., aj-2-inā-shən\ n 1: the act or power of forming a mental image of something not present to the senses or never before wholly perceived in reality 2 a: creative ability b: ability to confront and deal with a problem: RESOURCEFULNESS 3 : a creation of the mind; esp: an idealized or poetic creation b: fanciful or empty assumption 4: popular or traditional belief or conception

or conception syn IMAGINATION, FANCY, FANTASY shared meaning element: the power to form mental images of things not before one imag-i-na-tive \im-'aj-(a-)nat-iv, -'aj-a-nat-\ adj 1 a : of, relating to, or characterized by imagination b : devoid of truth : FALSE 2 : given to imagining : having a lively imagination 3

of or relating to images; esp: showing a command of imagery imag-i-na-tive-ly adv — imag-i-na-tive-ness n

